Longview®

Owner's Manual

MADE IN CALIFORNIA

The instructions, specifications, and recommendations in this manual are based on current information when this manual was released. ESW CleanTech, Inc. reserves the right to make changes at any time without obligation. If you find differences between your system and the information in this manual, contact your ESW CleanTech distributor or call ESW CleanTech at 1-800-398-6105.

Allmetal, Horizon, Lonestar, LongMile, Longview, MLC, Phoenix and Vista are registered trademarks of ESW CleanTech, Inc.

The ESW CleanTech logo and ESW CleanTech, Inc. are trademarks of ESW CleanTech, Inc.

This page intentionally left blank

Longview® Owner's Manual

Table of Contents

General Information....1
- Cautions....2
- Safety Warnings....2
- Owner's Legal Obligations....2
- Contact Information....3
- Installation....4
- Engine Repower....4
- Acronyms....4

System Description....5
- Product Summary....6
- Catalyst Assembly....7
- Control System....7
- Fuel Injection System....8
- Major Component Pictures....9
- CARB-Verification Labels....11

Operations....12
- Pay Attention to the System, Engine and Vehicle....13
- System Indicator Lights....13
- Monitoring the Fuel System....15
- Conditions That May Damage the Longview....16

Maintenance and Repair....17
- Your Right to Maintenance Information....18
- The Importance of Engine Maintenance....18
- The Importance of Properly Maintaining a Diesel Emission Control Strategy....18
- Maintenance Schedule....18
- Preventative Maintenance Labor and Parts....19
- Service Calls....20
- Parts List....21
- Troubleshooting Table....22
- Amber Light Flashing....23
- Repair and Maintenance Clarifications....25
- Engine Oil Consumption and Lube Oil Ash....26

Specifications....28

Owner's Obligations....30

Warranty....32
- Product Warranty....33
- Installation Warranty....34
- ESW CleanTech, Inc. Warranty Clarifications....34

CARB Executive Orders* for the Longview....35

GENERAL INFORMATION

Cautions

Please study this manual and understand the requirements for the ESW CleanTech, Inc. Longview® system before operating your vehicle.

The pictures and descriptions in this manual are for a typical Longview system. Some parts, components and configurations for your particular system may vary from those shown here depending on the vehicle and application.

The use of parts that are materially different than the verified retrofit parts or system may void the verification and the warranty. Ultra-low sulfur diesel fuel (ULSD) is required for your system (see p. 15) and all CARB Level 3 verified systems.

The Longview system is designed to operate automatically. This manual describes routine observations, periodic maintenance requirements, and the owner's obligations. Contact your distributor or an ESW CleanTech authorized technician if you need further assistance.

Safety Warnings

- **Do not touch the Longview catalyst assembly or tubing during or after operation. All surfaces can become hot and may cause burns. At times, the catalyst assembly (and especially the end cones) may be at a higher temperature than a muffler would be under the same engine conditions.**
- **The catalyst assembly stays hotter much longer than a stock muffler will after the engine is turned off.**
- **If it is necessary to move a hot catalyst module, use gloves and other appropriate precautions (as previously mentioned, it is much heavier than a muffler).**

Owner's Legal Obligations

Use of any alternative diesel fuels and or fuel additives not specifically listed in the CARB verification Executive Order (E.O.) is illegal and strictly prohibited. Operating with an unapproved alternative diesel fuel or fuel additive violates the E.O., negates the verification for that vehicle, and removes compliance status for the vehicle. The end-user must meet other requirements in the E.O. for the Longview which is provided in this manual beginning on page 35. The E.O. for the Longview may also be obtained from the CARB website at http://www.arb.ca.gov/diesel/verdev/level3/level3.htm.

The installation of the Longview system is based on the owner's understanding that adding a new part to or altering an original part of a certified configuration could be considered a violation of the tampering prohibition of the Clean Air Act. The owner understands that the installation of the Longview will not violate tampering provisions of the Act, at the time of

installation, because of the testing performed under the verification process and provided the owner adheres to all installation instructions and meets all operating and maintenance requirements for the Longview.

- **Events that require action by the owner or operator are given in the "Owner's Obligations" section beginning on page 30.**
- **If any of these events occur, it is the owner's obligation to take the appropriate action. Failure to do so may be the basis for denying a warranty claim.**

Contact Information

Contact an ESW CleanTech authorized distributor for any sales or service support for your Longview system. The tables below for contact information are provided for the customer to complete at their convenience. For more information, contact your local ESW CleanTech product support representative, call ESW CleanTech at 800-398-6105, or visit www.eswgroup.com.

Distributor	
Address	
Contact person	
Contact person's phone	
Contact person's fax	
Contact person's email	

Name of local ESW CleanTech product support representative	
Local ESW CleanTech representative's phone	
Local ESW CleanTech representative's email	

Installation

ESW CleanTech recommends that an ESW CleanTech authorized technician install the Longview system. The complete installation procedures are described in the Longview Installation Manual. Copies of the manual are available upon request from your distributor or ESW CleanTech The installation warranty (page 34) is the responsibility of the distributor that installs the Longview system.

Attention:

An ESW CleanTech certified technician must commission the system;
otherwise, that may be the basis for denying a warranty claim.
Warranty registration is submitted by the ESW CleanTech authorized distributor.

Engine Repower

A DECS installed on a vehicle that is repowered may remain installed provided:

- The replacement engine meets all the terms and conditions of the governing Executive Order or conditional verification letter,
- The DECS is not more than ten years old (based on the date of manufacture), and
- The appropriate DECS engine label is affixed to the replacement engine in a visible location.

Acronyms

BP	Backpressure
CARB	California Air Resources Board
CO	Carbon monoxide
DECS	Diesel Emissions Control System
DPF	Diesel particulate filter
HC	Hydrocarbons
LED	Light emitting diode (system indicator light)
MLC	The electronic controller in the system
MLinC	The software program used to communicate with the MLC
NO_x	Nitrogen oxides
NRC	NO_x reduction catalyst
OEM	Original equipment manufacturer
PM	Particulate matter (diesel soot)
TC	Thermocouple
ULSD	Ultra-low sulfur diesel fuel
VDC	Volts direct current

SYSTEM DESCRIPTION

Product Summary

The Longview system reduces oxides of nitrogen (NO_x), particulate matter (PM), carbon monoxide (CO) and unburned hydrocarbons (HC) from diesel engine exhaust. Features include:

- NO_x reduction catalyst (NRC)
- Diesel particulate filter (DPF)
- ESW CleanTech MLC (the electronic controller in the system)
- Stainless steel construction
- Modular design to facilitate installation, service and maintenance
- Sound attenuation eliminating the need for a muffler or silencer

The Longview system shown in Figure 1 consists of three main subsystems: the catalyst assembly, fuel delivery system, and the control system.

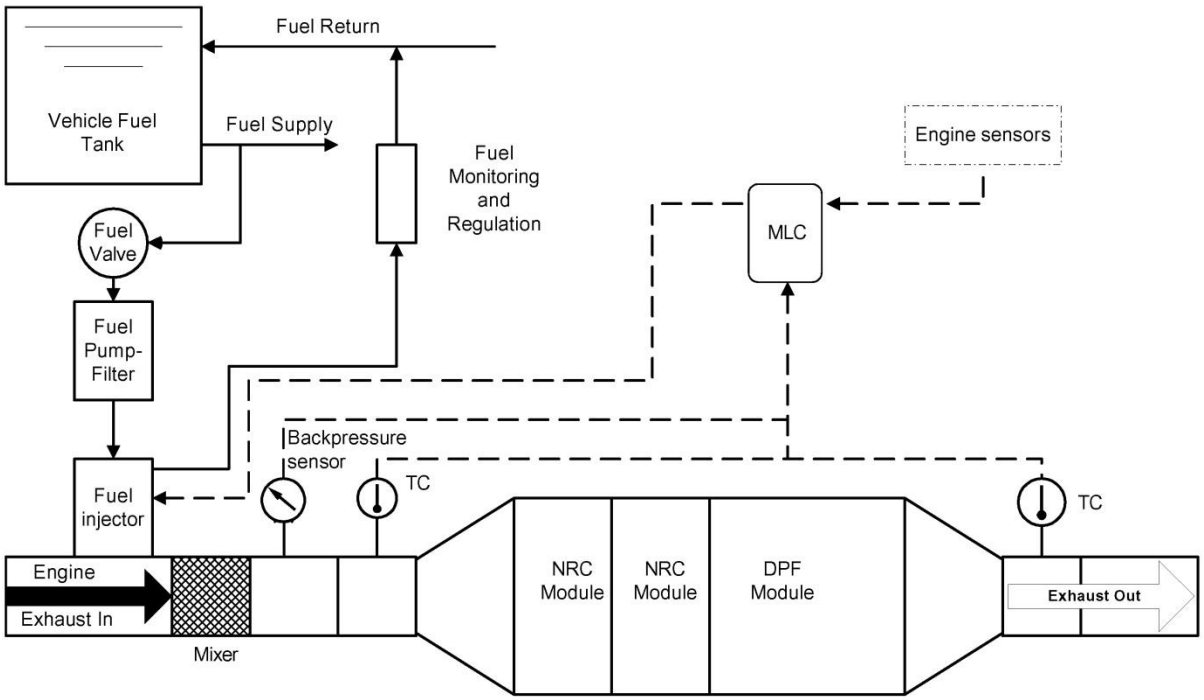

Figure 1: ESW CleanTech Longview system.

The MLC monitors engine conditions, Longview system operation and controls the fuel addition. The injector adds fuel at the rate dictated by the MLC in order to provide a reducing agent for the NRC. With the addition of diesel fuel to the engine exhaust by the fuel injector, the NRC reduces the NO_x emissions to the atmosphere. The catalyzed DPF reduces the PM, HC and CO emissions.

Catalyst Assembly

The catalyst assembly (Figure 2) is the core of the system and it replaces the stock muffler. ESW CleanTech provides a mounting assembly specifically designed for the Longview.

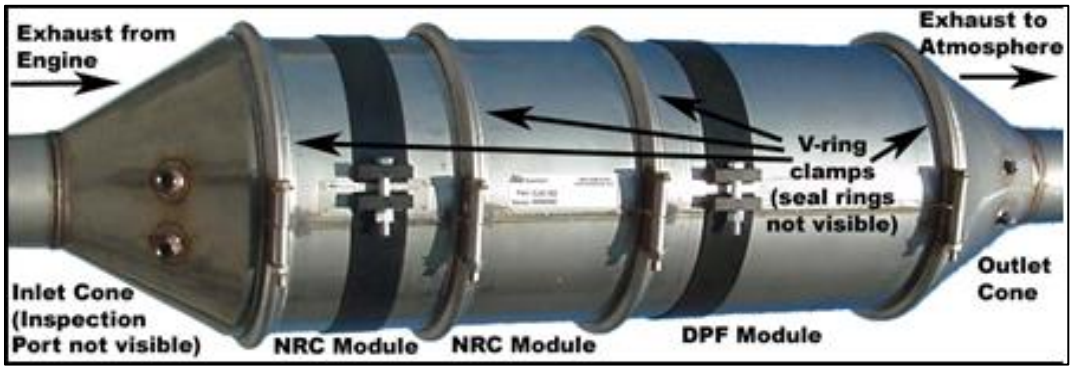

Figure 2: Catalyst Assembly (cone configurations vary depending on vehicle).

Care and handling requirements for the catalyst assembly are as follows:

1. Do not drop or hammer.
2. Use appropriate equipment when lifting.
3. Protect from water intrusion.
4. Protect from accidental impacts.
5. Do not weld.
6. Protect the flanges during transport (use the foam shipping covers).

Attention: Handle with care!

Although the catalyst assembly replaces the OEM muffler, be aware that the catalyst assembly is approximately twice the weight of a typical muffler.

The catalyst assembly creates backpressure on the engine

The DPF provides high filtration efficiency, which results in backpressure on the engine. The backpressure from the Longview varies instantaneously depending on the engine speed and load and the soot and ash loading in the DPF. At times, the backpressure from the Longview system may be higher than the backpressure caused by a muffler. However, other devices such as exhaust brakes put much higher backpressure loads on the engine for short time periods, and are approved by engine manufacturers. The backpressure caused by the Longview system is not nearly high enough to lead to excessive exhaust manifold temperatures or significant loss of performance. Typical average backpressure values from the Longview are well within acceptable levels for the engine. The control system continuously monitors backpressure and alerts the operator if necessary.

Control System

The control system consists of the MLC and various sensors. The MLC reads the backpressure sensor and uses the data to calculate the backpressure profile over a certain period of operation. If the pre-programmed thresholds are exceeded, the MLC causes the

amber LED to blink, thus alerting the operator or other personnel that the system is experiencing unusually high backpressure. The MLC also logs the time and conditions of the occurrence. The constant monitoring of the backpressure sensor by the MLC ensures that the backpressure is within safe limits and alerts the owner in time to take corrective action if necessary.

The MLC not only monitors the system and alerts the operator if service is required, but also continually logs operating data and records instances of unusual conditions. The MLC also controls the fuel injection system.

Fuel Injection System

The Fuel Injection System is shown in Figure 3. Fuel is drawn directly from the engine fuel supply system to ensure that it will not interfere with engine operation. A combination pump and filter pressurizes the fuel to the injector. (Note: the Longview fuel pump does not turn on until a few seconds after the engine starts.) The fuel injector is mounted in a fuel-cooled assembly attached to the exhaust tube upstream of the catalyst assembly. The fuel flow is monitored by the pressure switch and controlled by the pressure regulator and shut-off valve.

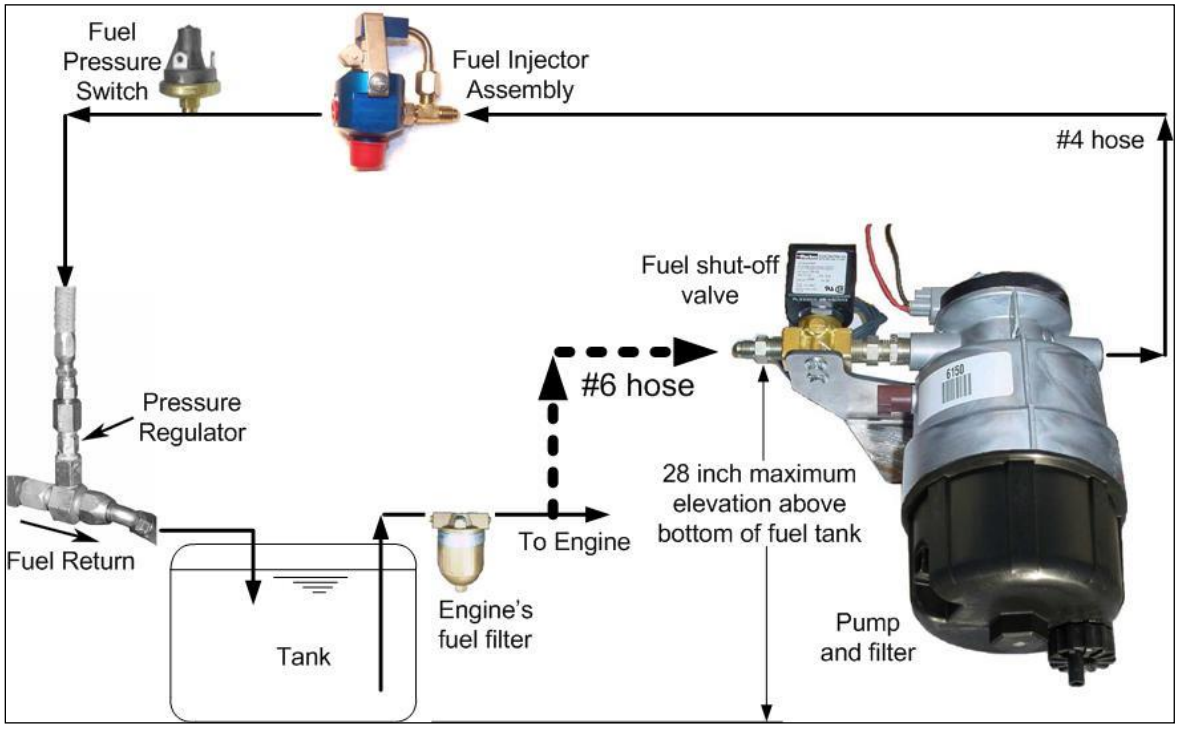

Figure 3: Fuel system flow diagram.

Major Component Pictures

The major components of the Longview system not previously shown are given in this section (the catalyst assembly is shown in Figure 2 on page 7 and the fuel injection system components are shown in Figure 3 on page 8).

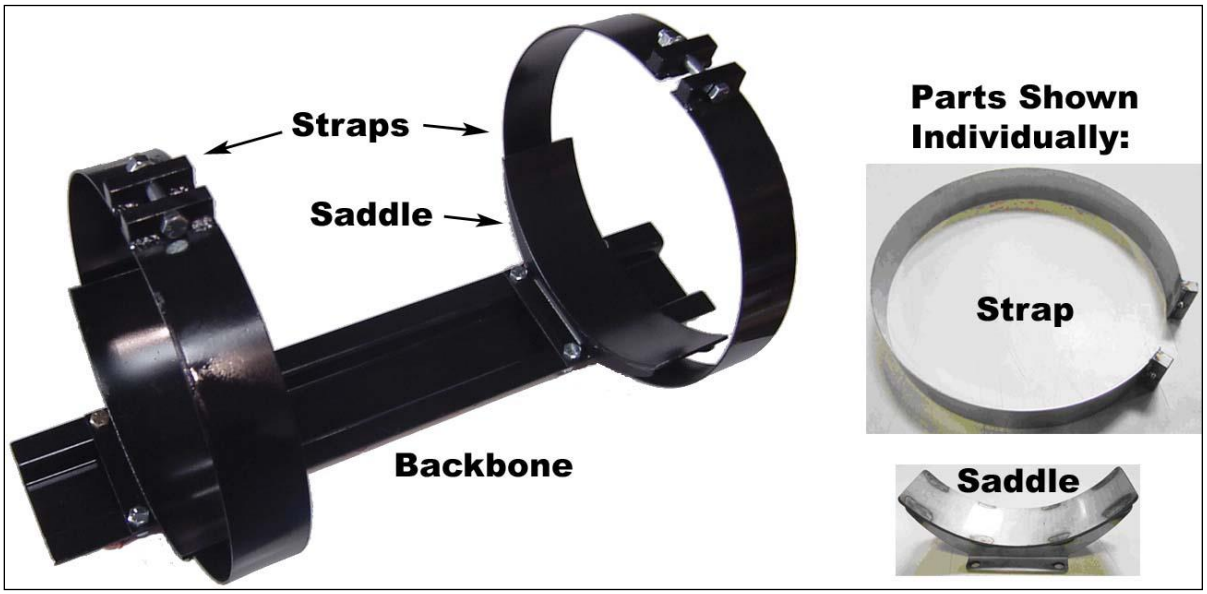

Figure 4: Mounting Assembly: backbone, saddles and straps.

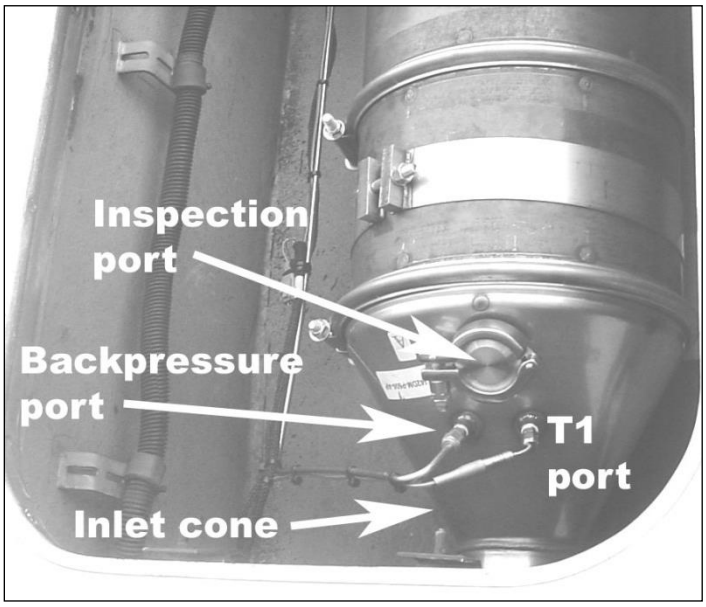

Figure 5: Inspection port.

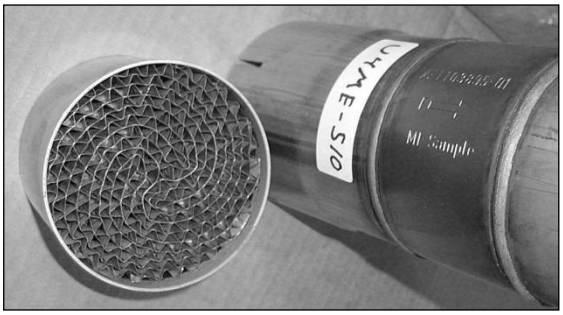

Figure 6: Mixer

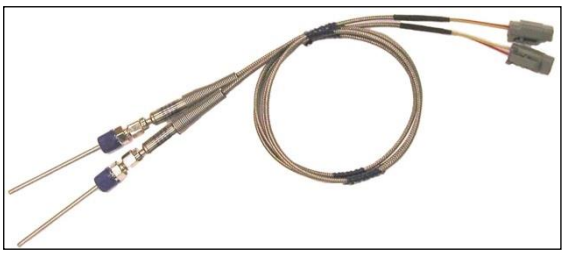

Figure 7: Thermocouples.

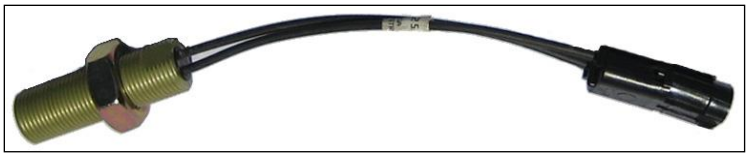

Figure 8:
Engine RPM sensor.

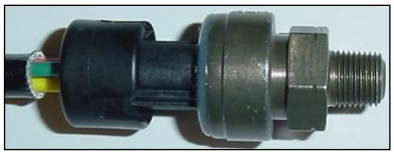

Figure 9:
Manifold pressure sensor.

Figure 10: Controls box.

CARB-Verification Labels

The system is provided with two CARB-verification labels. One is installed on the engine (

Figure **11**) and the other one is attached to the wiring harness at the Controls Box (

Figure **12**). If either one is missing, order a replacement label from an ESW CleanTech authorized distributor and be sure to order the correct label for your application (see the table below the pictures).

Figure 11: Example of CARB-verification label for Longview installed on engine.

Figure 12: CARB-verification label installed on Longview wiring harness at Controls Box.

Product	Application	Verification Family Name	Label Part Number
Longview	On road	CA/ECT/2008/PM3+/N25/ON/LNF01	CUH-2201-1K
Longview	On road	CA/ECT/2008/PM3+/N25/ON/LNF02	CUH-2201-2K

OPERATIONS

Pay Attention to the System, Engine and Vehicle

The green light on indicates that the system is operational. During normal operation, the amber light will be off. If the amber light turns on or blinks, contact an ESW CleanTech authorized technician (or a properly trained technician under the owner's control) as soon as practical. The indicator lights are described below. Refer to the Troubleshooting Table (page 22) if you suspect the system is not operating properly.

1. The operator should observe the green and amber lights regularly during normal operation and respond accordingly.
2. During engine operation, note any indications of unusual exhaust emissions or odor. Notify an ESW CleanTech authorized technician or the owner's technician if any unusual odors or emissions are observed.
3. Periodically inspect the exhaust system for integrity. Note anything abnormal and make repairs as warranted. For vertical exhaust stacks, make sure the rain cap is in place and functioning properly. Contact an ESW CleanTech authorized technician as needed.
4. Periodically inspect the Longview fuel system for integrity. Note anything abnormal and make repairs as needed. Contact an ESW CleanTech authorized technician as needed.

System Indicator Lights

The operator must observe the Longview system indicator lights on a regular basis and respond accordingly. The label placed next to the lights (Figure 13) provides a brief description of each light's meaning. The light meanings are explained in greater detail after the label below.

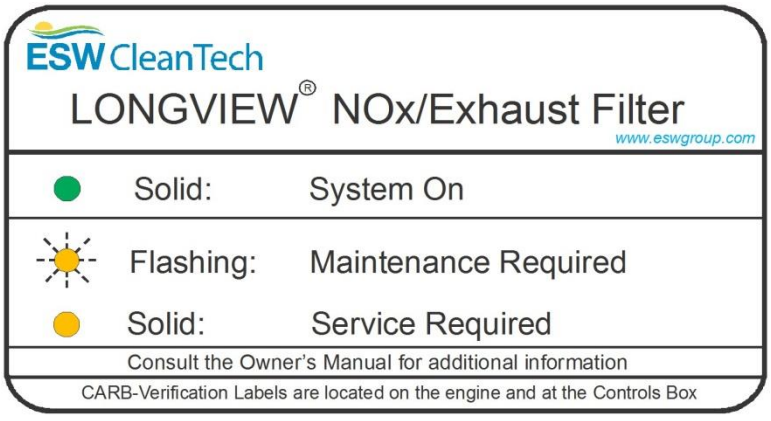
ESW CleanTech
LONGVIEW® NOx/Exhaust Filter
www.eswgroup.com
Solid: System On
Flashing: Maintenance Required
Solid: Service Required
Consult the Owner's Manual for additional information
CARB-Verification Labels are located on the engine and at the Controls Box

Figure 13: Label for Longview system indicator lights.

Condition	Meaning	Action
1. Green LED is off (while engine is on)	Longview needs service	Contact an ESW CleanTech authorized distributor for service.
2. Green LED is on solid	MLC is on	No action required (unless indicated by the amber light).
3. Amber LED flashing	High backpressure	Follow the “Amber Light Flashing” guide (p. 23).
4. Amber LED on solid	Longview needs service	Contact an ESW CleanTech authorized distributor for service.

- **Green Light – On:**

The green light indicates that the system power is on.

- **Green Light – Off:**

Attention:

If the green light is off while the engine is operating, service is required.

See the “Troubleshooting Table” (page 22) for possible causes and remedies.

- **Amber Light – Flashing:**

A flashing amber light indicates high backpressure. Maintenance is required.

A number of factors can cause this situation such as excessive idling or the engine producing excessive soot. These primary causes produce an overloaded DPF or soot accumulation on the NRC, which in turn cause high backpressure.

See the “Troubleshooting Table” (page 22) for possible causes and remedies.

If the amber light is still flashing after following the recommended procedures, then contact an ESW CleanTech authorized technician for maintenance.

- **Amber Light – On Solid:**

A solid amber light indicates a broken or disconnected sensor or a system fault.

Verify that all the wiring harness connections are properly attached. If the amber light stays on, have the system serviced as soon as possible. For some faults, the solid amber light can only be turned off through the service computer connection to the MLC.

The amber light will turn on solid for a few seconds after the engine starts. This allows the operator to confirm that the LED itself is operational.

ATTENTION:

A solid or flashing amber light indicates that service or maintenance is required.

Monitoring the Fuel System

The operator should observe both the engine and Longview system for the following:

- **Fuel Leaks:**

Clearly, any fuel leak presents a safety concern warranting immediate action. The first step is to investigate and see if the problem can be resolved immediately and locally. In the event that special parts (that is, Longview components) are at fault, then contact your distributor immediately for further assistance.

- **Fuel Consumption:**

Fuel consumption varies with the specific application, driving habits and other factors. Generally, the Longview system's fuel consumption will be in the range of 3% to 5% (or less) of the engine's fuel consumption. If you experience excessive fuel consumption, please contact the distributor.

- **Fuel Supply:**

The Longview system's operation depends on a clean fuel supply. An integrated fuel pump and filter is part of the Longview fuel system. The fuel filter should be inspected and replaced if necessary during the Longview system's preventative maintenance. Ultra-low sulfur diesel fuel (ULSD) is required for CARB Level 3 verified Longview applications.

Conditions That May Damage the Longview

The operator should be aware of conditions that could result in damage to or failure of the catalyst assembly or Longview system. If any of these events occur, it is the owner's responsibility to have the Longview inspected and, if necessary, repaired.

See the owner's legal requirements under the Clean Air Act and CARB regulations in the "Owner's Legal Obligations" section on page 2.

Mechanical damage can occur if any system component is mishandled or accidentally impacted. Internal damage to the catalyst assembly can occur from various forms of engine failure such as losing a turbo or head gasket. These events would cause foreign debris to enter the exhaust gas and then impact the catalyst assembly, likely causing some damage. Furthermore, losing a turbo or other major oil leaks could result in excessively high temperatures in the catalyst and DPF. If the engine loses the turbo, the driver should pull off the road as soon as possible and shut the engine off.

Engine oil consumption has an impact on the operation and maintenance of the Longview. If engine oil consumption exceeds the manufacturer's specification, the engine should be repaired. Failure to do so may damage the Longview and may be the basis for denying a warranty claim. High oil consumption will increase the rate of ash accumulation in the diesel particulate filter and will lead to more frequent maintenance. The "Engine Oil Consumption and Lube Oil Ash" section on page 26 explains the impacts of oil consumption and ash content on the operations and maintenance of the system.

Power washing the vehicle should not be a problem for the catalyst assembly, Longview system. Avoid pointing the high-power wash at any Longview system connectors. However, depending on the power washing technique, it may be possible to loosen an electrical connector. If a connector comes loose, the amber LED might light. If the amber light comes on, follow the procedures in the Troubleshooting Table (page 22).

For vertical stacks, be sure the rain cap is in place and functioning properly. It is important that water does not enter the exhaust pipe where it could migrate to the catalysts or DPF. Avoid low hanging branches or other obstacles that could knock off the rain cap.

MAINTENANCE AND REPAIR

Your Right to Maintenance Information

The Air Resources Board requires that ESW CleanTech provide detailed maintenance information for the diesel emission control system upon delivery to the end-user pursuant to section 2706(h)(2), Title 13, California Code of Regulations, at no additional cost to the owner. If you do not already have this information, contact ESW CleanTech at 1-800-398-6105.

The Importance of Engine Maintenance

Proper engine maintenance is critical for the proper functioning of your diesel emission control strategy. Failure to document proper engine maintenance, including oil consumption records, may be grounds for denial of a warranty claim for a failed component of a diesel emission control strategy.

The Importance of Properly Maintaining a Diesel Emission Control Strategy

Proper maintenance is critical for the diesel emission control strategy to function as intended. Failure to document proper diesel emission control strategy maintenance, including cleaning and/or ash removal of the system, replacement of consumables, and replacement of broken/failed parts, may be grounds for denial of a warranty claim for a failed component of a diesel emission control strategy.

Maintenance Schedule

ESW CleanTech recommends that an ESW CleanTech authorized technician or a properly trained technician under the owner's control perform the maintenance and repair of a Longview. Preventative maintenance is required once a year (unlimited operating hours) or every 50,000 miles, whichever comes first, to ensure the system is in good operating condition; however, the DPF may require cleaning more often than that depending on the engine's oil consumption rate. See the "Engine Oil Consumption and Lube Oil Ash" section on page 26 for more information.

The owner is legally required to keep the Longview in good operating condition in order to comply with the Clean Air Act and CARB regulations (for systems operating in California). See the "Owner's Legal Obligations" section on page 2.

Failure to have the preventative maintenance performed may be the basis for denying a warranty claim. Maintenance or repairs done by anyone other than an ESW CleanTech authorized technician is the responsibility of the person or organization performing the work. The cost of parts and labor for preventative maintenance are not included in the purchase price of the Longview system. The parts and labor included in preventative maintenance are listed in the "Preventative Maintenance Labor and Parts" section below.

Preventative Maintenance Labor and Parts

Preventative maintenance by an ESW CleanTech authorized technician includes:

- Download data from the MLC and review the Instant Report.
- Confirm the system indicator lights are functioning properly.
- Inspect the fuel injector assembly.
- Replace the fuel filter and inspect the fuel pump.
- Inspect the Controls Box and components.
- Inspect and clean the backpressure sensor tubing and breather filter.
- Inspect the sensors and wiring harness.
- Inspect and clean the DPF.
- Inspect the NRC modules and clean if necessary.
- Inspect exhaust tubing.
- Reinstall the DPF and confirm the system is securely mounted.
- Upgrade the MLC program if necessary.
- Make repairs (if any of the above inspections showed repairs are needed).
- Perform comprehensive tests of the system's operations.

Fuel Pump and Filter Maintenance

The integrated fuel pump and filter should be inspected during the scheduled annual maintenance. ESW CleanTech recommends changing the fuel filter at that time and anytime the engine fuel filter is changed.

Catalyst Assembly and DPF Maintenance

It may be necessary to periodically clean the DPF module (in addition to the annual cleaning) depending on the vehicle's driving cycle and the ash content of the diesel fuel and lube oil. The collection of inorganic ash results in an increase in backpressure from the catalyst assembly over time. If ash in the DPF results in high backpressure then the amber light will flash. Note: higher than normal oil consumption will increase the rate of ash accumulation in the DPF, and thus may require more frequent maintenance.

ESW CleanTech recommends the use of low-ash engine oils (CJ-4 oil). These products have been specifically designed for use with a DPF, and can significantly reduce the buildup of ash in the DPF and extend the filter cleaning interval. See the "Engine Oil Consumption and Lube Oil Ash" section on page 26.

An ESW CleanTech authorized distributor can clean the DPF module. They also will ensure that the collected material (ash and soot) is properly disposed in accordance with all applicable Federal, State and local laws governing waste disposal.

The catalyst assembly is designed to process exhaust flow in only one direction. The order of the individual modules within the catalyst assembly is also critical for the proper operation of the Longview system. If any sections are disassembled for maintenance (or any other reason), be sure that they are reinstalled in their proper position. Also be aware that the DPF module has a flow direction arrow on it and must be installed accordingly. The NRC modules can be installed in either direction as long as they are installed in their proper sequence within the catalyst assembly.

Exhaust Tubing and Components

All tubing connections between the engine and the catalyst assembly should be maintained in a gas-tight and leak-free manner. Also, all tubing between the engine and catalyst assembly must be maintained in good condition. This requirement includes any other components such as exhaust brakes. Aluminized mild steel tubing or rusty tubing could flake off into the exhaust stream. If flaking occurs, the catalyst or DPF may plug, resulting in high backpressure and engine power loss. ESW CleanTech recommends using stainless steel tubing between the turbo and the catalyst assembly. **It is the engine owner or operator's responsibility to ensure that all tubing in this critical area be maintained in good condition.**

Service Calls

The MLC controls the green and amber indicator lights to provide system status as described in the "System Indicator Lights" section (page 13). Not all conditions will be detected by the MLC (for example, an accident that physically damages the catalyst assembly). Therefore, it is important for the owner and/or operator to observe the engine and Longview operations in addition to watching the indicator lights. See the "Operations" section beginning on page 12 for routine observations that the driver and/or owner should perform. Also, see the "Owner's Obligations" section on page 30.

Upon any indication of a malfunction, promptly contact an ESW CleanTech authorized distributor (or the owner's technician). See the "Contact Information" section on page 3. Please be prepared with the following information:

1. Fault information and descriptions in as much detail as possible.
2. The part number and serial number of each catalyst and DPF module (see Figure 14).

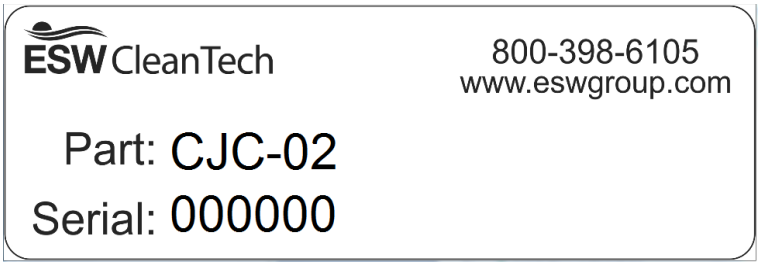

Figure 14: Example of NRC Module Data Plate.

Parts List

A complete parts list was provided with the system. Contact your ESW CleanTech authorized distributor if you need a replacement list. The major parts are listed in the table below, with underlined spaces representing variables that depend on specific configuration and application.

Longview System Major Parts List

Item #	Qty	Part Number	Description
1	1	C_F-_	Diesel Particulate Filter Assembly, Unidirectional
2	2	C_C-02	NOx reduction catalyst
3	1	C_ _ _D-__-AP__	Cone, inlet
4	1	C_ _ _-_	Cone, outlet
5	1	CMA-__-__	Sensor, RPM
6	2	CMA-4	Sensor, thermocouple
7	1	CMK-5.0_ or CMK-6.0_	~~MLC®~~MLC (electronic control unit)
8	1	CUE-45	Sensor, backpressure
9	1	CU_ME-_ _	Static mixer assembly
10	1	CUE-55	Diesel fuel pump/filter
11	1	CUP-7	Fuel pressure regulator
12	1	CUE-1	Injector assembly
13	1	CUE-41	Sensor, manifold absolute pressure
14	1	CUH-2201-1K or CUH-2201-2K	Kit, label, Verification, Longview

Underlined spaces represent variables depending on specific configuration and application.

Parts that may be required for preventative maintenance are not covered by the product warranty as discussed in the “Maintenance Schedule” section on page 18 and are listed in the table below.

Longview Maintenance Parts List

Part Number	Description
CUP-49	Fuel pump filter (small)
CUP-50	Fuel pump filter (large)

Troubleshooting Table

Use the table below to diagnose and resolve potential Longview operating problems. Most abnormal conditions will require service or repair by an ESW CleanTech authorized technician or a properly trained technician.

Condition	Probable Cause	Remedy
1. Green LED - On	• MLC has power (desired condition)	• No action required. • Operate & monitor normally.
2. Green LED - Off	• No power or open fuse • Loss of MLC program (if amber on and green off) • Faulty LED or wiring	• Check fuse, wires and power to the MLC. • Contact a properly trained technician for repair.
3. Amber LED blinks	• High backpressure (overloaded DPF or soot accumulation on NRC)	• Follow the "Amber Light Flashing" guide (p. 23). • Contact a properly trained technician for maintenance.
4. Amber LED on solid	• Sensor connection loose • Faulty sensor • System malfunction • Loss of MLC program (if amber on and green off)	• Check wiring connections. • Contact a properly trained technician promptly (system needs maintenance as soon as practical).
5. Fuel drips or leaks	• Loose connection(s) • Defective hose • Fatigued or damaged O-ring • Faulty injector	• Tighten connection(s). • Replace faulty parts. • Contact a properly trained technician for repair.
6. Unusual odor or exhaust noises	• Loose tubing connection(s) • Loose clamp(s) • Crack in exhaust tube • Crack in catalyst assembly • Loose injector mount • Engine injector or turbo problem	• Tighten connection(s). • Replace damaged tube. • Contact a properly trained technician for repair. • Repair the engine.
7. White smoke during startup	• Normal condensation inside catalyst assembly	• No action required.
8. Light soot dusting in exhaust tube	• Normal condition	• No action required.
9. Visible emissions (white or black smoke during normal operations)	• MLC power or signal loss • Fuel injector malfunction • Sensor failure • DPF failure	• Contact a properly trained technician for repair.
10. Engine surges or has power loss	• Engine malfunction • Loose connection in fuel system • Soot accumulation on NRC or overloaded DPF (Amber light should have been flashing)	• Repair the engine. • Contact a properly trained technician for service.

There is additional troubleshooting information in the Longview and Lonestar Service Manual., a manual intended for trained technicians.

Amber Light Flashing

A flashing amber light indicates high backpressure. High backpressure is usually the result of an overloaded DPF or soot accumulation on the front of the NRC.

The causes and remedies for an overloaded DPF or soot accumulation on the NRC are provided after the chart below. Follow Figure 15 to respond to a flashing amber light condition. The “Drive Hard Procedure” is explained after the chart.

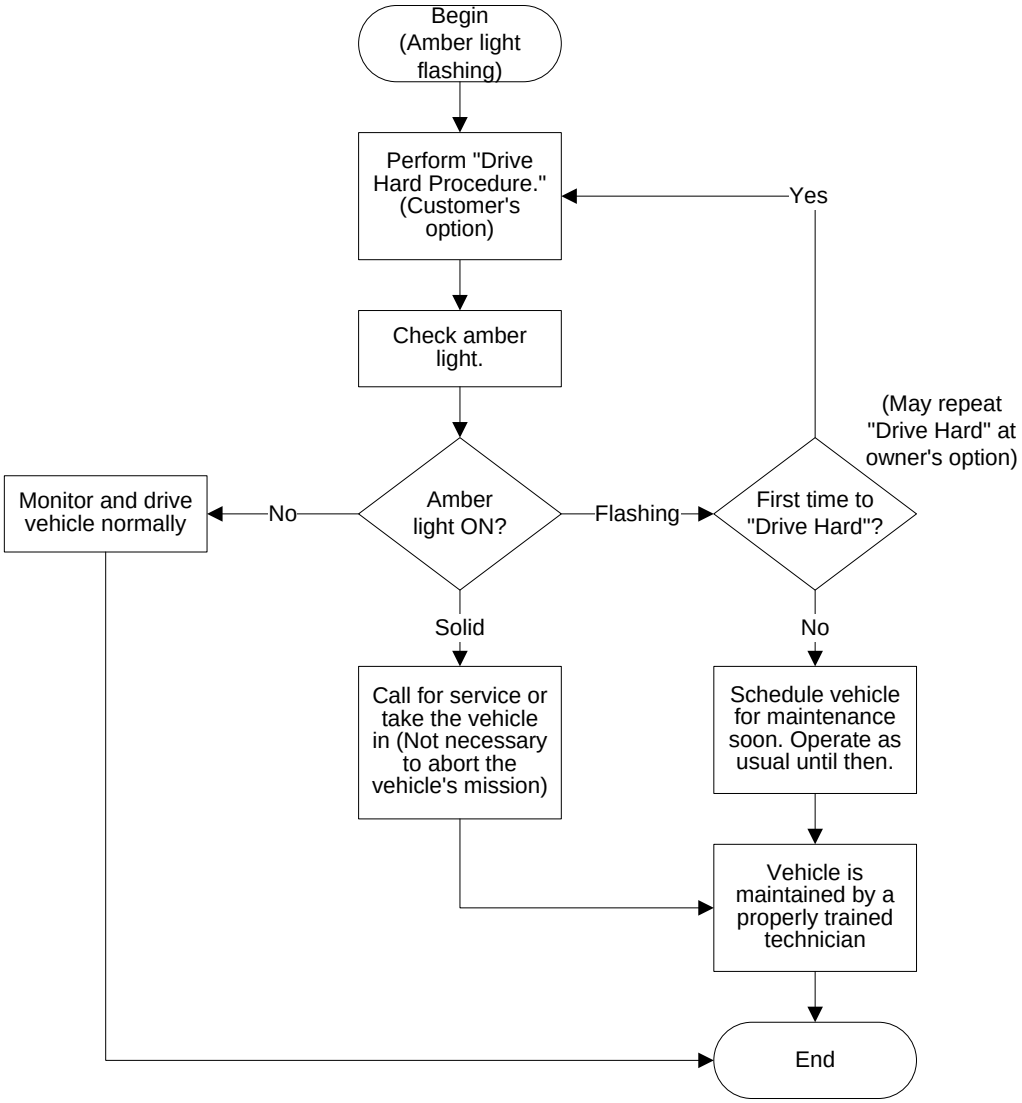
Begin (Amber light flashing)
Perform "Drive Hard Procedure." (Customer's option)
Yes
Check amber light.
(May repeat "Drive Hard" at owner's option)
Monitor and drive vehicle normally
No
Amber light ON?
Flashing
First time to "Drive Hard"?
Solid
No
Call for service or take the vehicle in (Not necessary to abort the vehicle's mission)
Schedule vehicle for maintenance soon. Operate as usual until then.
Vehicle is maintained by a properly trained technician
End

Figure 15: Flashing Amber Light Troubleshooting Process.

- **Drive Hard Procedure**

The customer may perform this procedure at their option. If they do not want to do it, then they should schedule the Longview for maintenance by a properly trained technician as soon as practicable. The vehicle may be operated normally until the maintenance appointment.

Run the engine hard, under as much load as possible, for at least 30 to 45 minutes at sustained intervals. This operation may regenerate the DPF, and the light will reset itself. Check the light again at the end of the day. If the amber light goes out, then operate normally from that time onward. If the light stays on, the customer may repeat this process at their option. If the amber light is still flashing after more than one "Drive Hard," then schedule the system for maintenance by a properly trained technician as soon as practicable. The operator may use the vehicle normally until the maintenance appointment.

ATTENTION:

If the amber light turns on solid at anytime, then the Longview will require maintenance by a properly trained technician.

- **DPF overloaded with soot or ash**

In some cases, driving the vehicle under load (Drive Hard Procedure) can regenerate a DPF overloaded with soot. Sometimes though, the high backpressure from the DPF is the result of ash loading in the DPF, which requires cleaning the DPF off of the vehicle.

If high backpressure from an overloaded DPF becomes repetitive, it might be that the engine is producing high levels of soot or the vehicle's duty cycle is relatively light. A light duty cycle causes the engine's average exhaust temperature to be too cold to regenerate the DPF consistently. Long idle times could also be the cause. Rotating the vehicle to a tougher duty cycle application or reducing idle time to a minimum may be sufficient to avoid repeat amber light events caused by a DPF overloaded with soot.

Another cause of a frequently overloaded DPF may be engine problems such as excessive oil consumption that result in a high rate of ash into the DPF. An ESW CleanTech authorized distributor can provide the DPF cleaning service to remove the ash.

Since engine problems may be the cause of the Longview amber light coming on, ESW CleanTech recommends that the engine receive a thorough evaluation if the amber light does not turn off after performing the "Drive Hard Procedure."

- **Soot accumulation on the NRC**

Soot accumulation on the NRC face occurs on a small percentage of vehicles due to a variety of factors including engine age and condition, bad fuel injectors, driver habits, driving cycle and engine load.

If NRC soot accumulation has occurred, a properly trained technician will be able to diagnose the condition and clean the NRC when the vehicle is brought in for maintenance according to Figure 15. The ESW CleanTech authorized distributor will be able to assist the customer in minimizing the impact of NRC soot accumulation on the vehicle's use and availability.

Since engine problems may be the cause of the excessive soot (and thus the amber light flashing), ESW CleanTech recommends that the engine receive a thorough evaluation if soot accumulation is frequent.

Repair and Maintenance Clarifications

The warranty (page 32) includes a section titled “Owner’s Warranty Responsibility” which clarifies that the owner or operator is responsible for making sure that the maintenance described in this owner’s manual is performed. In addition to the annual maintenance, the amber light is another indicator that maintenance is required.

ATTENTION:

The amber light indicates that service is required.

Maintenance items such as cleaning an overloaded DPF or soot accumulation on an NRC (that are caused by engine or vehicle operating conditions) are not warrantable items. If a repair is required, it may be covered under the installation or product warranty depending on the cause. The table below provides a summary of service types (maintenance or repair) and what organization is responsible for the cost of the service.

Service Type (and subtype)		**Definition/Example**	**Cost Responsibility**
Maintenance	(unplanned)	High backpressure from NRC soot accumulation or overloaded DPF.	Owner
	(regularly planned)	High backpressure from NRC soot accumulation or overloaded DPF.	Owner
	(annual)	De-ash filter, change fuel pump filter, perform multi-step complete system check out.	Owner
Repair	(warrantable)	System or component fails in normal application.	ESW CleanTech
	(warrantable)	System or component failed because it was installed improperly.	Installer
	(non-warrantable)	System or component damaged through abuse, neglect, or misapplication. Warranty period has lapsed.	Owner

Engine Oil Consumption and Lube Oil Ash

ESW CleanTech recommends that owners monitor the oil consumption of their engines and know the ash content of the engine oil to ensure that the DPF is scheduled for cleaning before it becomes overloaded with ash. This section of the manual provides information to extend the filter cleaning interval of the DPF.

The DPF is designed to capture all solid particles coming from the tailpipe. While most of the captured material can be readily regenerated (oxidized) inside the filter, the DPF will accumulate incombustible materials, collectively called “ash,” which cannot be regenerated and must be removed through offline cleaning.

The majority of the ash comes directly from oil consumed during engine operation, though small amounts of ash also come from the fuel and engine wear. Most of the ash that accumulates in the DPF is part of the lube oil additive package, and since the DPF will capture all solid materials coming from the engine exhaust, all the ash from oil consumption will ultimately end up in the DPF. Thus, the ash content of the lube oil and the oil consumption rate become critical factors in determining the rate of ash accumulation in the filter.

It is important to note that once the DPF captures approximately 200 grams (about 7 ounces) of ash, it will no longer be possible to remove all the ash from the filter using existing cleaning techniques. Therefore, it is important to proactively clean your DPF based on 1) oil consumption rate, and 2) lube oil ash content.

Pre-2007, CI-4 oil typically contains between 1.2 and 1.5% ash by weight. The new CJ-4 oils, designed especially for diesel engines with a DPF, contain approximately 1.0% ash, and will therefore result in a lower filter loading for a given amount of oil consumption. Given the ash content, the filter must be cleaned once the engine has consumed the following amount of oil:

Every 24 Quarts with CJ-4
Every 16 Quarts with CI-4

Using the ash content of these oils, the service intervals shown in Figure 16 are recommended to ensure optimum performance and cleanability of the DPF.

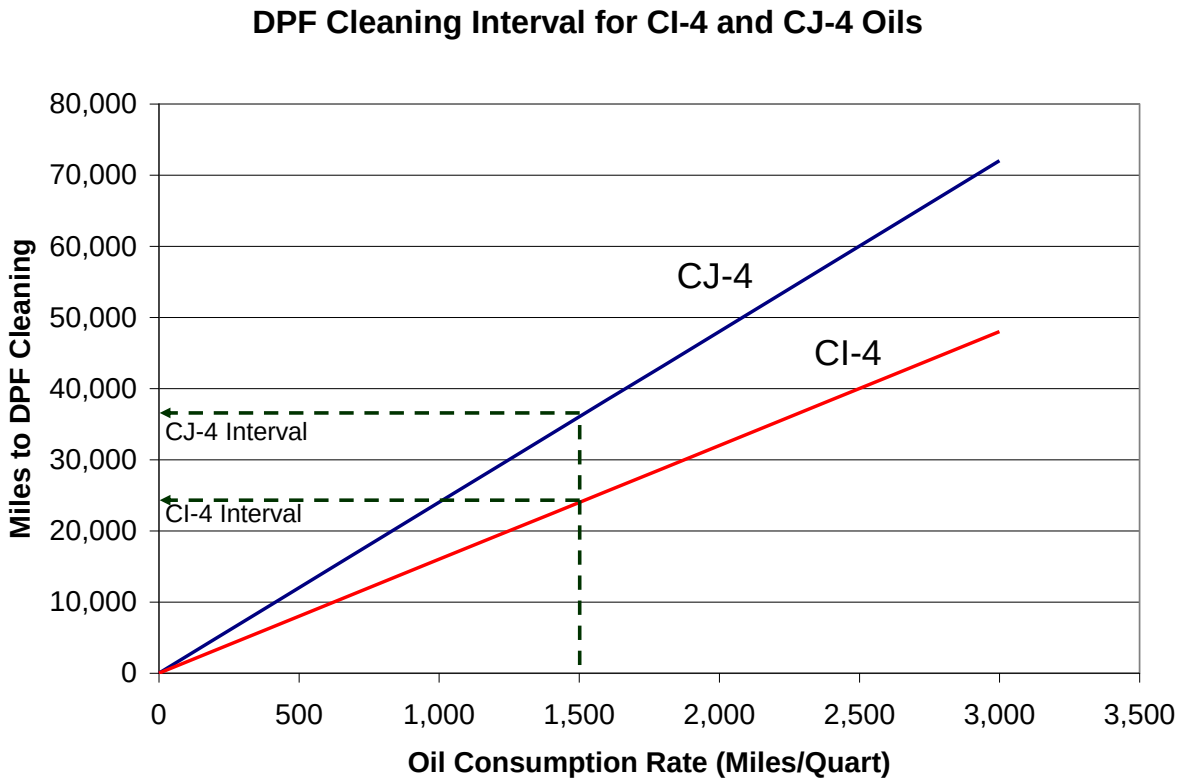

Figure 16: DPF cleaning interval as a function of oil consumption rate. (for a typical well maintained engine).

The values presented above are provided as estimations and may not apply to all filters in all applications. Factors like engine duty cycle, soot composition, ash composition and others can also have an impact on the filter cleaning interval. Furthermore, the guide applies only to ash accumulation in the filter; if the engine does not meet the temperature requirements for regeneration or if there are excessive soot emissions (e.g., from a failed injector), more frequent filter cleaning may be required to remove the soot.

ESW CleanTech, as an industry leader in filter cleaning techniques, continues its efforts to improve its cost-effective filter cleaning solutions. As these techniques improve, we expect to be able to clean filters with ash loadings greater than 200 grams, thereby extending the cleaning interval beyond the values described above.

In summary, to ensure that the DPF is fully cleanable, ESW CleanTech recommends that the customer monitor their oil consumption rate and schedule filter cleaning before the filter has accumulated 200 grams of ash. Customers can extend their filter cleaning interval by:

- Maintaining their engines to minimize oil consumption
- Switching to low ash oils

SPECIFICATIONS

Longview System	
J-Size System Total Weight	123 pounds
Catalyst Assembly Weight	98 pounds
Construction	304 Stainless Steel
Fuel Type (same as engine fuel)	ULSD or CARB diesel
Fuel Consumption (maximum)	2.2 gallons/hour

ESW CleanTech MLC	
Model	ESW CleanTech MLC, Rev. 5 or Rev. 6
Voltage	Rev 5: 9 to 15 VDC (12 V nominal) Rev 6: 9 to 28 VDC (12 or 24 V nominal)
Real time clock	Battery-backed
Diagnostic and Programming I/O	9-pin serial (RS-232) or USB serial adapter (adapter from harness required)
Inputs	
Catalyst Assembly Inlet Temperature	Type K thermocouple, ungrounded
Catalyst Assembly Outlet Temperature	Type K thermocouple, ungrounded
Engine RPM Sensor (Frequency)	0.5 – 12 kHz
Catalyst Assembly Backpressure	0 – 5 VDC
Engine Manifold Absolute Pressure	0 – 5 VDC
Fuel Pressure Switch	0 – 5 VDC
Outputs	
Fuel Pump Relay	12 VDC
Two Power Output Lines for Sensors	5 VDC
System Power On Indicator	Green LED (on)
System Service Indicator	Amber LED (on or flashing)
Pulse Width Modulation Channel	One

OWNER'S OBLIGATIONS

It is the owner or operator's obligation to take the appropriate action if any of these events or symptoms occurs. These actions are mandatory for proper system operation. Failure to follow the required action(s) could be the basis for denying a warranty claim or a fine by CARB.

Event or Symptom	Owner's Action Item	Manual Section
Initial installation of Longview system.	Review this manual and pay close attention to each item in the "Operations" section.	"Operations" (page 12).
Flashing amber light. (high backpressure)	May perform the "Drive Hard Procedure" at the operator's option. Contact a properly trained technician as needed.	"System Indicator Lights" (page 13) and "Troubleshooting Table" (page 22).
Solid amber light. (bad sensor or system fault)	Contact a properly trained technician as soon as possible.	"System Indicator Lights" (page 13) and "Troubleshooting Table" (page 22).
Engine failure (such as turbo failure, injector failure, excess oil consumption, or leaky head gasket).	If the turbo fails, get off the road safely ASAP and shut the engine off. Contact a properly trained technician immediately. (Longview catalysts or system components may be damaged from foreign material.)	"Conditions That May Damage the Longview" (page 16).
Road debris or other object impacts Longview system or components.	Contact a properly trained technician immediately since system components may be damaged, including hidden damage to internal catalyst components.	"Catalyst Assembly" (page 7) and "Conditions That May Damage the Longview" (page 16).
Tubing or exhaust component (turbo or exhaust brake, for example) between the engine and the catalyst assembly is removed, replaced or in poor condition.	Ensure that the tubing or component is installed properly and that no debris could enter the exhaust stream. (Debris or foreign matter in the exhaust stream can damage the catalysts or system components. Also, exhaust leaks may result in poor system performance and safety hazards.)	"Exhaust Tubing and Components" (page 20).
For a vertical exhaust stack, the rain cap is knocked off or somehow missing.	Replace the rain cap immediately. If any water entered the exhaust pipe then contact the distributor immediately.	"Catalyst Assembly" (page 7) and "Conditions That May Damage the Longview" (page 16).
Oil consumption is more than the engine manufacturer's specification.	Monitor and keep accurate records of the engine's oil consumption rate. If oil consumption exceeds the specification, repair the engine so that oil consumption is within the manufacturer's specification.	"Conditions That May Damage the Longview" (page 16) and "Engine Oil Consumption and Lube Oil Ash" (page 26).

WARRANTY

Product Warranty

YOUR WARRANTY RIGHTS AND OBLIGATIONS

ESW CleanTech, Inc. warrants the diesel emission control system in the application for which it is sold or leased to be free from defects in design, materials, workmanship, or operation of the diesel emission control system which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, for the periods of time listed in Table 1, provided there has been no abuse, neglect, or improper maintenance of your diesel emission control system, vehicle or equipment, as specified in the owner's manuals. Where a warrantable condition exists, this warranty also covers the engine from damage caused by the diesel emission control system, subject to the same exclusions for abuse, neglect or improper maintenance of your vehicle or equipment. Please review your owner's manual for other warranty information. Your diesel emission control system may include a core part (e.g., particulate filter, diesel oxidation catalyst, selective catalytic reduction converter) as well as hoses, connectors, a back pressure monitor (if applicable), and other emission-related assemblies. Where a warrantable condition exists, ESW CleanTech, Inc. will repair or replace your diesel emission control system at no cost to you including diagnosis, parts, and labor.

Table 1: Warranty Period

Engine Type	Engine Size	Warranty Period
On-Road	Light heavy-duty, 70 to 170 hp, Gross Vehicle Weight Rating (GVWR) less than 19,500 lbs.	5 years or 150,000 miles
	Medium heavy-duty, 170 to 250 hp, GVWR from 19,500 lbs. to 33,000 lbs.	
	Heavy heavy-duty, exceeds 250 hp, GVWR exceeds 33,000 lbs.	
	Heavy heavy-duty, exceeds 250 hp, GVWR exceeds 33,000 lbs., and the truck is: 1. Typically driven over 100,000 miles per year, and 2. Has less than 300,000 miles on the odometer at the time of installation.	2 years, unlimited miles
Off-Road (includes portable engines), Stationary, Marine, Locomotives, TRU and APU	Under 25 hp, and for constant speed engines rated under 50 hp with rated speeds greater than or equal to 3,000 rpm	3 years or 1,600 hours
	At or above 25 hp and under 50 hp	4 years or 2,600 hours
	At or above 50 hp	5 years or 4,200 hours

WARRANTY COVERAGE

For an engine used in an application listed in Table 1, the warranty period will be the years or hours or miles of operation shown in Table 1, whichever occurs first. If any emission-related part of your diesel emission control system is defective in design, materials, workmanship, or operation of the diesel emission control system thus causing the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706, and 2710, within the warranty period, as defined above, ESW CleanTech, Inc. will repair or replace the diesel emission control system, including parts and labor.

In addition, ESW CleanTech, Inc. will replace or repair the engine components to the condition they were in prior to the failure, including parts and labor, for damage to the engine proximately caused by the verified diesel emission control strategy. This also includes those relevant diagnostic expenses in the case in which a warranty claim is valid. ESW CleanTech, Inc. may, at its option, instead pay the fair market value of the engine prior to the time the failure occurs.

OWNER'S WARRANTY RESPONSIBILITY

As the vehicle, engine, or equipment owner, you are responsible for performing the required maintenance described in your owner's manual. ESW CleanTech, Inc. recommends that you retain all maintenance records and receipts for maintenance expenses for your vehicle, engine, or equipment, and diesel emission control system. If you do not keep your receipts or fail to perform all scheduled maintenance, ESW CleanTech, Inc. may have grounds to deny warranty coverage. You are responsible for presenting your vehicle, equipment, or engine, and diesel emission control system to an ESW CleanTech, Inc. distributor as soon as a problem is detected. The warranty repair or replacement should be completed in a reasonable amount of time, not to exceed 30 days. If a replacement is needed, this may be extended to 90 days should a replacement not be available, but must be performed as soon as a replacement becomes available.

If you have questions regarding your warranty rights and responsibilities, you should contact ESW CleanTech, Inc. at 1-800-398-6105 or the California Air Resources Board at 9528 Telstar Avenue, El Monte, California 91731, or (800) 363-7664, or electronic mail: helpline@arb.ca.gov.

Installation Warranty

YOUR WARRANTY RIGHTS AND OBLIGATIONS

The installer must warrant that the installation of a diesel emission control system is free from defects in workmanship or materials which cause the diesel emission control system to fail to conform to the emission control performance level it was verified to, or to the requirements in the California Code of Regulations, Title 13, Sections 2700 to 2706. The warranty period and the extent of the warranty coverage provided by the installer must be the same as the warranty provided by ESW CleanTech, Inc., and the same exclusions apply.

OWNER'S WARRANTY RESPONSIBILITY

As the vehicle, engine, or equipment owner, you are responsible for presenting your vehicle, engine, or equipment, and diesel emission control system to the installer as soon as a problem with the installation is detected.

If you have questions regarding your warranty rights and responsibilities, you should contact the installer or ESW CleanTech, Inc. at (800) 398-6105 or the California Air Resources Board at 9528 Telstar Avenue, El Monte, California 91731, or (800) 363-7664, or electronic mail: helpline@arb.ca.gov.

ESW CleanTech, Inc. Warranty Clarifications

(Which do not limit or modify the provisions of the Product Warranty or Installation Warranty in any way)

The product warranty above is the sole warranty made by ESW CleanTech, Inc. There are no other warranties, expressed or implied, of merchantability or fitness for a particular purpose.

For the purpose of the product warranty and installation warranty, abuse or neglect includes vehicle accidents, ignoring the system indicator lights, blending lubricating oil with fuel, or any engine failure or condition that are not proximately caused by the diesel emission control system that allows excess lubricating oil, coolant, contaminants or debris to enter the exhaust system. The owner shall not use any fuel additive or lube oil additive that is not approved by EPA or CARB for use in diesel engines equipped with catalytic mufflers.

ESW CleanTech, Inc. recommends that the verified diesel emissions control strategy be installed and serviced by ESW CleanTech, Inc. authorized personnel. Improper installation or service by unauthorized or untrained personnel may result in a denial of coverage under the product warranty or installation warranty.

CARB EXECUTIVE ORDERS* FOR THE LONGVIEW

* Note that the first EO is for engines without an original equipment DOC muffler, the second EO is for engines which have an original DOC muffler.

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER DE-08-006-05

The diesel emission control strategy described herein qualifies as a potential compliance option for the Air Resources Board's (ARB) in-use diesel fleet rules.

Pursuant to the authority vested in ARB by the *Health and Safety Code*, Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by *Health and Safety Code* Sections 39515 and 39516 and Executive Order G-02-003;

Relating to Exemptions under Section 27156 of the *Vehicle Code*, and Verification under Sections 2700 to 2711 of Title 13 of the *California Code of Regulations* (CCR)

ESW CleanTech, Incorporated (ESW CleanTech)
Longview Diesel Particulate Filter System (Longview)

ARB has reviewed ESW CleanTech's request for verification of the Longview system. Based on an evaluation of the data provided, and pursuant to the terms and conditions specified below, the Executive Officer of ARB hereby finds that the Longview system reduces emissions of diesel particulate matter (PM) consistent with a Level 3 device (greater than or equal to an 85 percent reduction), reduces emissions of oxides of nitrogen (NOx) consistent with a Mark 1 device (greater than or equal to a 25 percent reduction) (Title 13, CCR, Sections 2702 (f) and 2708), and is compliant with the 2009 nitrogen dioxide emissions limit. Accordingly, the Executive Officer determines that the system merits verification and, subject to the terms and conditions specified below, classifies the Longview system as a Level 3 Plus, Mark 1 system for heavy-duty on-road vehicles that use certain heavy-duty engines. Engines for which the Longview system is verified, the verified parts list, the verified labels, swapping and re-designation information, and other product information can be found here:

http://www.arb.ca.gov/diesel/verdev/companies/esw/longview.htm.

The aforementioned verification is subject to the following terms and conditions:

- The engine must be originally manufactured from model year 1993 through 2006.
- The engine must be used by an on-road motor vehicle with a manufacturer's Gross Vehicle Weight Rating of over 14,000 pounds.
- The engine must be certified for on-road applications.
- The engine must not employ exhaust gas recirculation.
- The engine's displacement must not exceed 14 liters.

- The engine must have a power rating of at most 450 horsepower.
- The application must have a duty cycle with a temperature profile greater than 260 degrees Celsius for at least 25 percent of the time.
- The engine must be in its original certified configuration.
- The engine must not be certified to have a pre-existing original equipment manufacturer (OEM) diesel particulate filter (DPF).
- The engine must not be certified to have a pre-existing OEM diesel oxidation catalyst.
- For model years 1994 and newer, the engine must have a PM certification level of at most 0.1 grams per brake horsepower-hour (g/bhp-hr), and greater than 0.01 g/bhp-hr.
- The engine must have a four-stroke combustion cycle.
- The engine must be turbocharged.
- The engine must be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
- Lube oil, or other oil, must not be mixed with the fuel.
- The engine must be operated on fuel that has a sulfur content of no more than 15 parts per million by weight.
- The system must not be operated with fuel additives, as defined in Section 2701 of Title 13 of the CCR, unless explicitly verified for use with the fuel additive(s).
- The system must not be used with any other systems or engine modifications without approval from ARB and the manufacturer.
- The system must be installed with a backpressure monitor to notify the operator when the backpressure limit is reached. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use.
- The other terms and conditions specified below.

IT IS ALSO ORDERED AND RESOLVED: That installation of the Longview system, manufactured by ESW CleanTech Incorporated, 6755 Mira Mesa Boulevard, Suite 123-122, San Diego, California 92121, has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore the Longview system is exempt from the prohibitions in Section 27156 of the *Vehicle Code*

for installation on heavy-duty on-road vehicles. This exemption is only valid provided the engines meet the aforementioned conditions.

ARB reserves the right in the future to review this Executive Order and the exemption and verification provided herein to assure that the exempted and verified add-on or modified part continues to meet the standards and procedures of CCR, Title 13, Section 2222, et seq, and CCR, Title 13, Sections 2700 through 2711.

The Longview system consists of the following major system components, listed in order from exhaust inlet to outlet as they are arranged within the exhaust system of the vehicle: one fuel injector, one static mixer, one inlet cone, two lean NOx catalyst modules, one catalyzed wall-flow DPF, and one outlet cone. The Longview system also includes a backpressure monitor and warning system. The major components of the Longview system are identified in the parts list. The parts list and schematics of the approved product and engine labels are available on the website shown above.

The Longview system is comprised of two lean NOx catalyst modules and a single catalyzed wall-flow DPF designed to filter the exhaust from a single engine. Longview systems with multiple DPFs, including designs with two or more filter components canned together or multiple individually-canned filter components in parallel or in series (or any combination thereof), are not valid under this Executive Order. Channeling exhaust from a single engine through multiple Longview systems, deployed in parallel or in series or any combination thereof, is also not valid under this Executive Order.

No changes are permitted to the system. ARB must be notified, in writing, of any changes to any part of the Longview system. Any changes to the system must be evaluated and approved in writing by ARB. Failure to do so shall invalidate this Executive Order.

ESW CleanTech must ensure that the installation of the Longview system conforms to all applicable industrial safety requirements.

Changes made to the design or operating conditions of the Longview system, as exempted by ARB, which adversely affect the performance of the vehicle's pollution control system, shall invalidate this Executive Order.

This Executive Order is valid provided that installation instructions for the Longview system do not recommend tuning the vehicle to specifications different from those of the vehicle manufacturer.

Marketing of the Longview system using identification other than that shown in this Executive Order or for an application other than that listed in this Executive Order is prohibited unless prior written approval is obtained from ARB.

This Executive Order does not apply to any Longview system advertised, offered for sale, sold with, or installed on a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

A copy of this Executive Order must be provided to the ultimate purchaser at the time of sale.

As specified in Section 2706(j) (Title 13, CCR) of the *Verification Procedure, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (Procedure), ARB assigns each diesel emission control strategy a family name. The designated family name for the verification as outlined above is:

CA/ECT/2008/PM3+/N25/ON/LNF01

The designated family name CA/ECT/2008/PM3+/N25/ON/LNF01 replaces the previous name CA/CLE/2008/PM3+/N25/ON/LNF01.

As stated in the Procedure, ESW CleanTech is responsible for recordkeeping requirements (Section 2702), honoring the required warranty (Section 2707), and conducting in-use compliance testing (Section 2709).

Proper engine maintenance is critical for the proper functioning of the diesel emission control strategy. The owner of the vehicle on which the diesel emission control strategy is installed is strongly advised to adhere to all good engine maintenance practices. Failure to document proper engine maintenance, including keeping records of the engine's oil consumption, may be grounds for denial of a warranty claim.

Use of system parts or replacement parts not authorized by ESW CleanTech may be grounds for denial of a warranty claim.

This Executive Order is valid provided that the diesel fuel used in conjunction with the device complies with Title 13, CCR, Sections 2281 and 2282, and if biodiesel is used, the biodiesel blend shall be 20 percent or less subject to the following conditions:

- The biodiesel portion of the blend complies with the American Society for Testing and Materials specification D6751 applicable for 15 parts per million sulfur content; and

- The diesel fuel portion of the blend complies with Title 13, CCR, Sections 2281 and 2282.

Other alternative diesel fuels such as, but not limited to, ethanol diesel blends and water emulsified diesel fuel are excluded from this Executive Order.

The Longview system must not be located over any occupied space (e.g., driver or passenger compartments) or any other location deemed unacceptable by

ESW CleanTech, and must not be installed in a way which would result in noncompliance with any applicable safety standards including but not limited to Federal Motor Carrier Safety Administration, Subpart G, *Miscellaneous Parts and Accessories*, Section 393.83 *Exhaust Systems*.

Systems verified under this Executive Order shall conform to all applicable California emissions regulations.

The terms and conditions of this Executive Order must be satisfied regardless of where the system is sold in order for the system to be considered verified.

Systems sold as verified, or which carry the ARB-approved label, must satisfy all the terms and conditions of this Executive Order.

This Executive Order does not release ESW CleanTech from complying with all other applicable regulations.

Violation of any of the above conditions shall be grounds for revocation of this Executive Order.

This Executive Order hereby supersedes Executive Order DE-08-006-04 (dated June 16, 2011), Executive Order DE-08-006-03 (dated January 18, 2011), Executive Order DE-08-006-02 (dated January 14, 2010), Executive Order DE-08-006-01 (dated February 27, 2009), and Executive Order DE-08-006 (dated December 9, 2008).

Executed at El Monte, California, and effective this 13th day of June 2013.

for A6H

Annette Hebert, Chief
Mobile Source Control Division

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER DE-08-007-05

The diesel emission control strategy described herein qualifies as a potential compliance option for the Air Resources Board's (ARB) in-use diesel fleet rules.

Pursuant to the authority vested in ARB by the *Health and Safety Code*, Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by *Health and Safety Code* Sections 39515 and 39516 and Executive Order G-02-003;

Relating to Exemptions under Section 27156 of the *Vehicle Code*, and Verification under Sections 2700 to 2711 of Title 13 of the *California Code of Regulations* (CCR)

ESW CleanTech, Incorporated (ESW CleanTech)
Longview Diesel Particulate Filter (DPF) System (Longview)

ARB has reviewed ESW CleanTech's request for verification of the Longview system. Based on an evaluation of the data provided, and pursuant to the terms and conditions specified below, the Executive Officer of ARB hereby finds that the Longview system reduces emissions of diesel particulate matter (PM) consistent with a Level 3 device (greater than or equal to an 85 percent reduction), reduces emissions of oxides of nitrogen (NOx) consistent with a Mark 1 device (greater than or equal to a 25 percent reduction) (Title 13, CCR, Sections 2702 (f) and 2708), and is compliant with the 2009 nitrogen dioxide emissions limit. Accordingly, the Executive Officer determines that the system merits verification and, subject to the terms and conditions specified below, classifies the Longview system as a Level 3 Plus, Mark 1 system for heavy-duty on-road vehicles that use certain heavy-duty engines. Engines for which the Longview system is verified, the verified parts list, the verified labels, swapping and re-designation information, and other product information can be found here:

http://www.arb.ca.gov/diesel/verdev/companies/esw/longview.htm.

The aforementioned verification is subject to the following terms and conditions:

- The engine must be originally manufactured from model year 1993 through 2006.
- The engine must be used by an on-road motor vehicle with a manufacturer's Gross Vehicle Weight Rating of over 14,000 pounds.
- The engine must be certified for on-road applications.
- The engine must not employ exhaust gas recirculation.
- The engine's displacement must not exceed 14 liters.

- The engine must have a power rating of at most 450 horsepower.
- The application must have a duty cycle with a temperature profile greater than 260 degrees Celsius for at least 25 percent of the time.
- The engine must be in its original certified configuration.
- The engine must not be certified to have a pre-existing original equipment manufacturer (OEM) DPF.
- The engine must be certified to have a pre-existing OEM diesel oxidation catalyst (DOC). The DOC may be removed to facilitate installation of the Longview system.
- For model years 1994 and newer, the engine must have a PM certification level of at most 0.1 grams per brake horsepower-hour (g/bhp-hr), and greater than 0.01 g/bhp-hr.
- The engine must have a four-stroke combustion cycle.
- The engine must be turbocharged.
- The engine must be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
- Lube oil, or other oil, must not be mixed with the fuel.
- The engine must be operated on fuel that has a sulfur content of no more than 15 parts per million by weight.
- The system must not be operated with fuel additives, as defined in Section 2701 of Title 13 of the CCR, unless explicitly verified for use with the fuel additive(s).
- The system must not be used with any other systems or engine modifications without approval from ARB and the manufacturer.
- The system must be installed with a backpressure monitor to notify the operator when the backpressure limit is reached. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use.
- The other terms and conditions specified below.

IT IS ALSO ORDERED AND RESOLVED: That installation of the Longview system, manufactured by ESW CleanTech Incorporated, 6755 Mira Mesa Boulevard, Suite 123-122, San Diego, California 92121, has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore the Longview system is exempt from the prohibitions in Section 27156 of the *Vehicle Code*

for installation on heavy-duty on-road vehicles. This exemption is only valid provided the engines meet the aforementioned conditions.

ARB reserves the right in the future to review this Executive Order and the exemption and verification provided herein to assure that the exempted and verified add-on or modified part continues to meet the standards and procedures of CCR, Title 13, Section 2222, et seq, and CCR, Title 13, Sections 2700 through 2711.

The Longview system consists of the following major system components, listed in order from exhaust inlet to outlet as they are arranged within the exhaust system of the vehicle: one fuel injector, one static mixer, one inlet cone, two lean NOx catalyst modules, one catalyzed wall-flow DPF, and one outlet cone. The Longview system also includes a backpressure monitor and warning system. The major components of the Longview system are identified in the parts list. The parts list and schematics of the approved product and engine labels are available on the website shown above.

The Longview system is comprised of two lean NOx catalyst modules and a single catalyzed wall-flow DPF designed to filter the exhaust from a single engine. Longview systems with multiple DPFs, including designs with two or more filter components canned together or multiple individually-canned filter components in parallel or in series (or any combination thereof), are not valid under this Executive Order. Channeling exhaust from a single engine through multiple Longview systems, deployed in parallel or in series or any combination thereof, is also not valid under this Executive Order.

No changes are permitted to the system. ARB must be notified, in writing, of any changes to any part of the Longview system. Any changes to the system must be evaluated and approved in writing by ARB. Failure to do so shall invalidate this Executive Order.

ESW CleanTech must ensure that the installation of the Longview system conforms to all applicable industrial safety requirements.

Changes made to the design or operating conditions of the Longview system, as exempted by ARB, which adversely affect the performance of the vehicle's pollution control system, shall invalidate this Executive Order.

This Executive Order is valid provided that installation instructions for the Longview system do not recommend tuning the vehicle to specifications different from those of the vehicle manufacturer.

Marketing of the Longview system using identification other than that shown in this Executive Order or for an application other than that listed in this Executive Order is prohibited unless prior written approval is obtained from ARB.

This Executive Order does not apply to any Longview system advertised, offered for sale, sold with, or installed on a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

A copy of this Executive Order must be provided to the ultimate purchaser at the time of sale.

As specified in Section 2706(j) (Title 13, CCR) of the *Verification Procedure, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (Procedure), ARB assigns each diesel emission control strategy a family name. The designated family name for the verification as outlined above is:

CA/ECT/2008/PM3+/N25/ON/LNF02

The designated family name CA/ECT/2008/PM3+/N25/ON/LNF02 replaces the previous name CA/CLE/2008/PM3+/N25/ON/LNF02.

As stated in the Procedure, ESW CleanTech is responsible for recordkeeping requirements (Section 2702), honoring the required warranty (Section 2707), and conducting in-use compliance testing (Section 2709).

Proper engine maintenance is critical for the proper functioning of the diesel emission control strategy. The owner of the vehicle on which the diesel emission control strategy is installed is strongly advised to adhere to all good engine maintenance practices. Failure to document proper engine maintenance, including keeping records of the engine's oil consumption, may be grounds for denial of a warranty claim.

Use of system parts or replacement parts not authorized by ESW CleanTech may be grounds for denial of a warranty claim.

This Executive Order is valid provided that the diesel fuel used in conjunction with the device complies with Title 13, CCR, Sections 2281 and 2282, and if biodiesel is used, the biodiesel blend shall be 20 percent or less subject to the following conditions:

- The biodiesel portion of the blend complies with the American Society for Testing and Materials Specification D6751 applicable for 15 parts per million sulfur content; and

- The diesel fuel portion of the blend complies with Title 13, CCR, Sections 2281 and 2282.

Other alternative diesel fuels such as, but not limited to, ethanol diesel blends and water emulsified diesel fuel are excluded from this Executive Order.

The Longview system must not be located over any occupied space (e.g., driver or passenger compartments) or any other location deemed unacceptable by

ESW CleanTech, and must not be installed in a way which would result in noncompliance with any applicable safety standards including but not limited to Federal Motor Carrier Safety Administration, Subpart G, *Miscellaneous Parts and Accessories*, Section 393.83 *Exhaust Systems*.

Systems verified under this Executive Order shall conform to all applicable California emissions regulations.

The terms and conditions of this Executive Order must be satisfied regardless of where the system is sold in order for the system to be considered verified.

Systems sold as verified, or which carry the ARB-approved label, must satisfy all the terms and conditions of this Executive Order.

This Executive Order does not release ESW CleanTech from complying with all other applicable regulations.

Violation of any of the above conditions shall be grounds for revocation of this Executive Order.

This Executive Order hereby supersedes Executive Order DE-08-007-04 (dated June 16, 2011), Executive Order DE-08-007-03 (dated January 18, 2011), Executive Order DE-08-007-02 (dated January 14, 2010), Executive Order DE-08-007-01 (dated February 27, 2009), and Executive Order DE-08-007 (dated December 9, 2008).

Executed at El Monte, California, and effective this 13th day of June 2013.

for Annette Hebert, Chief
Mobile Source Control Division

This page intentionally left blank

ESW CleanTech, Inc.
6755 Mira Mesa Blvd.
Suite 123-122
San Diego, CA 92121
1-800-398-6105